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REMARKS

Claims 2-4 and 6-11 are pending in this application. All claims stand rejected under 35 USC 112, first paragraph. Claims 2-4, 6 and 7 stand rejected under 35 USC 112, second paragraph. Claims 2-4, 6-8 and 11 stand rejected under 35 USC 102(b) as being anticipated by Honeywell. Claims 2-4 and 6-11 stand rejected under 35 USC 102(b) as being anticipated by General Electric. Claims 2-4 and 6-11 stand rejected under 35 USC 102(b) as being anticipated by Rigney.

Rejection of claims 2-4 under 35 USC 112, first paragraph:

Independent claim 2 has been amended to include the limitation that the region of mixed oxide particles comprises zirconium and yttrium dispersed in an alumina matrix, thereby overcoming the rejection under 35 USC 112, first paragraph.

Rejection of claims 6 and 7 under 35 USC 112, first paragraph:

Independent claim 6 has been amended to include the limitation that the region of mixed oxide particles comprises zirconium and yttrium dispersed in an alumina matrix, thereby overcoming the rejection under 35 USC 112, first paragraph.

Rejection of claims 8-11 under 35 USC 112, first paragraph:

The Applicants traverse the rejection of claims 8-11 under 35 USC 112, first paragraph. The Examiner identifies limitations from one embodiment of the present invention that is described in the specification and is illustrated in FIGs. 1 and 2. The Examiner then requires that all of the limitations from that embodiment be included in claims 8-11. Among the limitations identified by the Examiner are "a mixed oxide layer disposed between the layer of thermally grown oxide and the layer of ceramic oxide insulating material" and "wherein the mixed oxide particles have a size range of less than 200nm." The Examiner then states (in error) that "No ceramic thermal barrier coating is disclosed in the disclosure without the above structure."

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In direct contradiction to the Examiner's assertion, however, independent claim 8 is directed to the embodiment illustrated in FIG. 3, where the nano sized features are columnar grains formed within individual splats of the insulating material, not particles in the mixed oxide layer disposed between the thermally grown oxide layer and the layer of insulating material. Furthermore, independent claim 9 is directed to the embodiment illustrated in FIG. 4, where the nano sized features are secondary columnar grains extending from the primary columnar grains of the ceramic insulating material, not particles in the mixed oxide layer disposed between the thermally grown oxide layer and the layer of insulating material. Finally, independent claim 11 is directed to the more general embodiment described in the specification at page 4, line 30 through page 6, line 6, wherein the Applicants have innovatively recognized the relationship between the Specific Surface Area and the performance of the insulation, thereby enabling the design of a ceramic thermal barrier material having improved performance over prior art materials that lack the claimed high Specific Surface Area. This innovation is described in the specification with respect to ceramic thermal barrier coatings generally, not being limited only to those having the limitations quoted by the Examiner and illustrated in FIGs. 1 and 2. Thus, the limitations identified by the Examiner are not critical or essential to the invention, and the rejection of claims 8-11 under 35 USC 112, first paragraph is without support and should be withdrawn.

Rejection of claims 2-4 under 35 USC 112, second paragraph:

Independent claim 2 has been amended herein to eliminate the lack of clear antecedent basis, thereby overcoming this rejection of claims 2-4.

Rejection of claims 2-4, 6 and 7 under 35 USC 112, second paragraph:

Independent claims 2 and 6 have been amended herein to identify the elements represented by the M in MCrAlY, thereby overcoming this rejection of claims 2-4, 6 and 7.

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Art-based rejections under 35 USC 102(b):

The Applicants traverse the rejections of all claims as being anticipated by the cited prior art references. MPEP §2131 provides that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim. The elements must be arranged as required by the claim. Each of the rejected claims contains limitation(s) that are not taught by the cited prior art references, as follows.

Regarding the rejection of claims 2-4, 6-8 and 11 as anticipated by Honeywell WO 01/63008:

Independent claim 2 includes the limitations of "a mixed oxide layer formed of mixed oxide particles comprising zirconium and yttrium dispersed in an alumina matrix and having a size range of less than 100 nm disposed between the thermally grown oxide layer and the layer of ceramic oxide insulating material." In contrast, the nano sized particles of Honeywell are disposed at the interfaces 22 between the layers 24. No such nano sized particles are taught by Honeywell between his layers 14 and 26, as is required by claim 2. Thus, the rejection of claims 2-4 is not supported by the art.

Independent claim 6 includes the limitations of "a mixed oxide layer comprising zirconium and yttrium dispersed in an alumina matrix and disposed between the layer of thermally grown oxide and the layer of ceramic oxide insulating material; and wherein the region of nano-sized features comprises a plurality of alumina projections extending across the interface from the mixed oxide layer into the insulating material layer and having a cross-sectional lineal density of between 1 and 10 projections per 200 nm." In contrast, the nano sized particles of Honeywell are disposed at the interfaces 22 between the layers 24. No nano sized projections are taught by Honeywell between layers 14 and 26, as is required by claim 6. Furthermore, there is no teaching in Honeywell of the claimed lineal density, nor does the penny shape of the pores disclosed in Honeywell provide any teaching or suggestion as to their lineal density. Thus, the rejection of claims 6 and 7 is not supported by the art.

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Independent claim 8 includes the limitations of "the nano sized features comprise columnar grains having cross-sectional widths in the range of 1-5 nm formed within individual splats of a ceramic insulating material deposited by an air plasma spray process." In contrast, Honeywell describes a coating deposited by an EB-PVD process which produces no splats of material, and certainly not splats having the claimed features. Thus, the rejection of claim 8 is not supported by the art.

Independent claim 11 includes the limitation of "a region of features maintaining a Specific Surface Area of at least 20,000 cm²/cm³ after exposure of the material to a temperature of 1,200 °C for 1,000 hours." The Examiner states "The claimed specific surface area is considered inherent." However, MPEP 2112 paragraph IV makes it clear that the Examiner has the burden of proof to provide a rationale or evidence tending to show inherency. The Examiner has provided no such rationale or evidence. Furthermore, the claimed Specific Surface Area can only be achieved with special attention to processing conditions, and *In re Rijckaert* cited in MPEP 2112 paragraph IV found that a rejection based upon inherency is improper if the inherency is based on what would result due to optimization of conditions, not on what was necessarily present in the prior art. Therefore the rejection of claim 11 under 35 USC 102 based upon Honeywell is improper, unsubstantiated, and should be withdrawn.

Regarding the rejection of claims 2-4 and 6-11 as anticipated by General Electric EP 1 209 321:

Independent claim 2 includes the limitations of "a mixed oxide layer formed of mixed oxide particles comprising zirconium and yttrium dispersed in an alumina matrix and having a size range of less than 100 nm disposed between the thermally grown oxide layer and the layer of ceramic oxide insulating material." In contrast, the nano sized particles of General Electric are disposed within the bulk of the TBC material layer 26. No such nano sized particles are taught by General Electric between layers 28 and 26, as is required by claim 2. Thus, the rejection of claims 2-4 is not supported by the art.

Independent claim 6 includes the limitations of "a mixed oxide layer comprising zirconium and yttrium dispersed in an alumina matrix and disposed between the layer

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of thermally grown oxide and the layer of ceramic oxide insulating material; and wherein the region of nano-sized features comprises a plurality of alumina projections extending across the interface from the mixed oxide layer into the insulating material layer and having a cross-sectional lineal density of between 1 and 10 projections per 200 nm." In contrast, the nano sized particles of General Electric are disposed within the bulk TBC material layer 26. No nano sized projections are taught by General Electric between layers 28 and 26, as is required by claim 6. Furthermore, there is no teaching in General Electric of the claimed lineal density, nor does the irregular flattened grain shape of the ceramic insulating material disclosed in General Electric provide any teaching or suggestion as to their lineal density. Thus, the rejection of claims 6 and 7 is not supported by the art.

Independent claim 8 includes the limitations of "the nano sized features comprise columnar grains having cross-sectional widths in the range of 1-5 nm formed within individual splats of a ceramic insulating material deposited by an air plasma spray process." In contrast, General Electric describes a coating deposited by an EB-PVD process which produces no splats of material, and certainly not splats having the claimed features. Thus, the rejection of claim 8 is not supported by the art.

Independent claim 9 includes the limitations of "the nano-sized features comprise secondary columnar grains extending laterally from the primary columnar grains and having lengths in the range of 5-80 nm." There is no teaching in General Electric of secondary columnar grains having such characteristics. Thus, the rejection of claims 9 and 10 is not supported by the art.

Independent claim 11 includes the limitation of "a region of features maintaining a Specific Surface Area of at least 20,000 cm²/cm³ after exposure of the material to a temperature of 1,200 °C for 1,000 hours." The Examiner states "The claimed specific surface area is considered inherent." However, MPEP 2112 paragraph IV makes it clear that the Examiner has the burden of proof to provide a rationale or evidence tending to show inherency. The Examiner has provided no such rationale or evidence. Furthermore, the claimed Specific Surface Area can only be achieved with special attention to processing conditions, and *In re Rijckaert* cited in MPEP 2112 paragraph IV found that a rejection based upon inherency is improper if the inherency

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is based on what would result due to optimization of conditions, not on what was necessarily present in the prior art. Therefore the rejection of claim 11 under 35 USC 102 based upon General Electric is improper, unsubstantiated, and should be withdrawn.

Regarding the rejection of claims 2-4 and 6-11 as anticipated by Rigney 6,620,525:

Independent claim 2 includes the limitations of "a mixed oxide layer formed of mixed oxide particles comprising zirconium and yttrium dispersed in an alumina matrix and having a size range of less than 100 nm disposed between the thermally grown oxide layer and the layer of ceramic oxide insulating material." In contrast, the nano sized particles of Rigney are disposed within the erosion resistant layers 32. No such nano sized particles are taught by Rigney between layers 28 and 30, as is required by claim 2. Thus, the rejection of claims 2-4 is not supported by the art.

Independent claim 6 includes the limitations of "a mixed oxide layer comprising zirconium and yttrium dispersed in an alumina matrix and disposed between the layer of thermally grown oxide and the layer of ceramic oxide insulating material; and wherein the region of nano-sized features comprises a plurality of alumina projections extending across the interface from the mixed oxide layer into the insulating material layer and having a cross-sectional lineal density of between 1 and 10 projections per 200 nm." In contrast, the nano sized particles of Rigney are disposed within the erosion resistant layers 32. No nano sized projections are taught by Rigney between his layers 28 and 30, as is required by claim 6. Thus, the rejection of claims 6 and 7 is not supported by the art.

Independent claim 8 includes the limitations of "the nano sized features comprise columnar grains having cross-sectional widths in the range of 1-5 nm formed within individual splats of a ceramic insulating material deposited by an air plasma spray process." In contrast, Rigney describes a coating deposited by an EB-PVD process which produces no splats of material, and certainly not splats having the claimed features. Thus, the rejection of claim 8 is not supported by the art.

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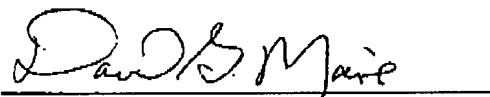
Independent claim 9 includes the limitations of "the nano-sized features comprise secondary columnar grains extending laterally from the primary columnar grains and having lengths in the range of 5-80 nm." There is no teaching in Rigney of secondary columnar grains having such characteristics. Thus, the rejection of claims 9 and 10 is not supported by the art.

Independent claim 11 includes the limitation of "a region of features maintaining a Specific Surface Area of at least 20,000 cm²/cm³ after exposure of the material to a temperature of 1,200 °C for 1,000 hours." The Examiner states "The claimed specific surface area is considered inherent." However, MPEP 2112 paragraph IV makes it clear that the Examiner has the burden of proof to provide a rationale or evidence tending to show inherency. The Examiner has provided no such rationale or evidence. Furthermore, the claimed Specific Surface Area can only be achieved with special attention to processing conditions, and *In re Rijckaert* cited in MPEP 2112 paragraph IV found that a rejection based upon inherency is improper if the inherency is based on what would result due to optimization of conditions, not on what was necessarily present in the prior art. Therefore the rejection of claim 11 under 35 USC 102 based upon Rigney is improper, unsubstantiated, and should be withdrawn.

Conclusion:

Reconsideration of the amended application and allowance of claims 2-4 and 6-11 are respectfully requested.

Respectfully submitted,



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